Water Recovery Project (WRP)

Completed Technology Project (2011 - 2014)

Project Introduction

The AES Water Recovery Project (WRP) is advancing environmental control and life support systems water recovery technologies to support human exploration beyond low earth orbit. For FY12-14, the AES Water Recovery Project is focused on the following: Cascade Distillation System (CDS): development of new primary processor for water recovery Brine Water Recovery: develop/test systems to recover water from urine brines GreenTreat: evaluate effectiveness of low toxicity urine pretreatments Dormancy: assess impacts of dormancy (unmanned time periods) on beyond LEO water systems Silver Biocide: investigate usage of silver biocide for potable water disinfection Water System Architecture: establish the architecture for NASA's future Water Recovery System This project merged into AES Life Support Systems Project in FY15.

The development of reliable, energy-efficient, and low-mass spacecraft systems to provide environmental control and life support (ECLS) is critical to enable long duration human missions beyond low Earth orbit (LEO). The Human Exploration Framework Team (HEFT) identified high-reliability life support systems as a required technology for destinations beyond cis-lunar space. The AES Water Recovery Project (WRP), led by Johnson Space Center (JSC) and partnered with the Ames Research Center (ARC), Glenn Research Center (GRC), and Marshall Space Flight Center (MSFC) is advancing water recovery technologies within the framework established by HEFT and the AES program. Recycling of life support consumables is necessary to reduce resupply mass and provide for vehicle autonomy. Although an integrated life support system is made up of a variety of systems to sustain functions such as atmospheric revitalization, thermal control, and waste management, a major driver in the sizing of a life support system is the Water Recovery System (WRS). As mission durations increase, recycling of water becomes critical. Stored water is inadequate, and wastewater sources must be recycled into potable water. The state-of-the-art (SOA) WRS used on board the International Space Station (ISS) relies on a high rate of consumable use and has experienced issues with precipitation and biofouling that have required operational and design changes. Due to these issues the recovery rate of wastewater on ISS (Condensate and Urine) is currently limited to approximately 74%. The mission of the AES Water Recovery project is to develop advanced water recovery systems in order to enable NASA human exploration missions beyond LEO. The primary objective of the AES WRP is to develop water recovery technologies critical to near term missions beyond LEO. The secondary objective is to continue to advance mid-readiness level technologies to support future NASA missions. They also lead to further closure of the WRS, approaching the goal of 98% closure established by the Human Health, Life Support, and Habitation Systems road map (OCT TA06).

Anticipated Benefits

3. Team running Cascade Distillation System test.

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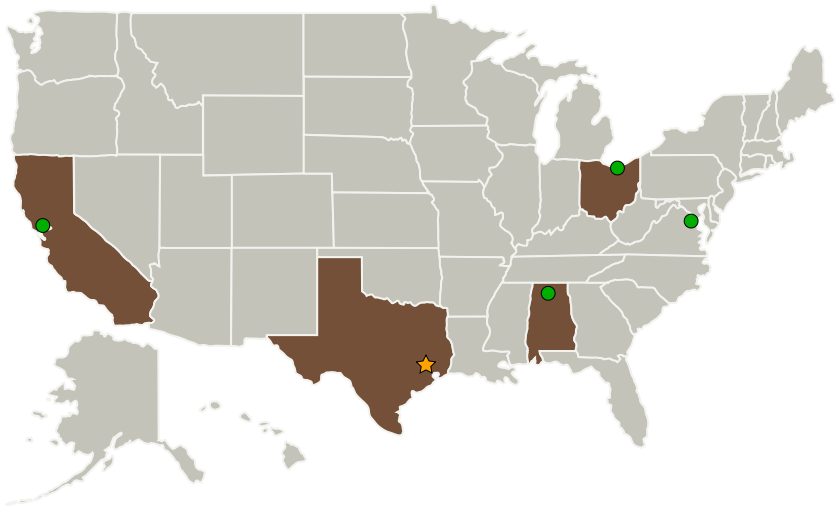
These technologies can lead to a regenerable, reliable, closed-loop life support system that enables long-term human exploration beyond low earth orbit.

Primary U.S. Work Locations and Key Partners



Organizational Responsibility

Responsible Mission Directorate:

Exploration Systems Development Mission Directorate (ESDMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Exploration Capabilities

Project Management

Program Director:

Christopher L Moore

Project Manager:

Sarah A Shull

Principal Investigator:

Sarah A Shull

Co-Investigator:

Miriam J Sargusingh

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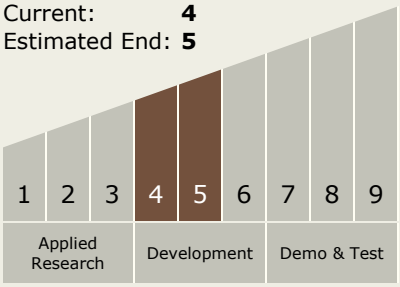
Organizations Performing Work	Role	Type	Location
★Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
●Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
●Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
Honeywell International	Supporting Organization	Industry	
●Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama
NanoMaterials Company	Supporting Organization	Industry	Malvern, Pennsylvania
●NASA Headquarters(HQ)	Supporting Organization	NASA Center	Washington, District of Columbia
Paragon Space Development Corporation	Supporting Organization	Industry	Tucson, Arizona
Portland State University	Supporting Organization	Academia	Portland, Oregon
Reactive Innovations, LLC	Supporting Organization	Industry	Westford, Massachusetts
Tietronix Software, Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Houston, Texas
UMPQUA Research Company	Supporting Organization	Industry	Myrtle Creek, Oregon

Technology Maturity (TRL)

Start: **4**
Current: **4**
Estimated End: **5**



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.2 Water Recovery and Management

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Primary U.S. Work Locations	
Alabama	California
District of Columbia	Ohio
Texas	

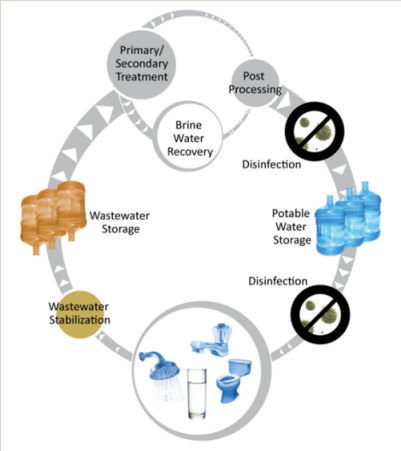
Project Transitions

October 2011: Project Start

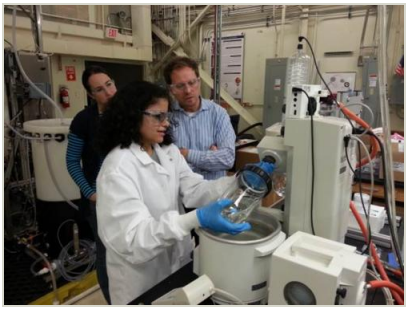
September 2014: Closed out

Closeout Summary: To request closeout information for this project, please send an email with the Subject "TechPort Closeout Report Request" to hq-aes@mail.nasa.gov and specify which project closeout report you are requesting.

Images



1. Water Recovery Project.
1. Water Recovery Project.
(https://techport.nasa.gov/image/1153)



2. Team working on GreenTreat in the JSC Water Lab.
2. Team working on GreenTreat in the JSC Water Lab.
(https://techport.nasa.gov/image/2738)

3. Team running Cascade Distillation System test.
3. Team running Cascade Distillation System test.
(https://techport.nasa.gov/image/2739)